The Open Geospatial Consortium (OGC®)

Request for Quotation

And

Call for Participation

for the

Incident Management Information Sharing (IMIS) Internet of Things (IoT) Pilot

-- Main Body --

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Proposal Due Date: 22 May 2015

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1 Introduction

1.1 Purpose

The purpose of this Request for Quotation and Call for Participation (hereafter referred to as RFQ/CFP) is to solicit proposals in response to a set of requirements for the OGC's Incident Management Information Sharing (IMIS) Internet of Things (IoT) Interoperability Program (IP) Pilot initiative.

The OGC, on behalf of the project sponsors, will provide cost-sharing funds to partially offset expenses uniquely associated with the initiative, thus the solicitation is for quotations from bidders wishing to receive cost-sharing. However, not all proposals are expected to seek cost-share funding. OGC intends to involve as many participants in the initiative as possible; to the extent each participant can enhance and/or contribute to the initiative outcomes.

1.2 Background

Many new forms of low-cost wireless sensors are being developed that can quickly make a wide range of pertinent observations of the incident environment and its effects on people, including responders themselves. Among the types of sensor available or being developed are in situ environmental sensors, wearable sensors, and imaging sensors on mobile platforms such as UAV's and autonomous vehicles. Evolving networking technology is making it possible for these sensors to establish basic network connectivity automatically as soon as they are deployed, either as IP devices directly on the Internet or indirectly through low-power local mesh protocols such as ZigBee or Thread.

Basic connectivity is not enough, however. Actionable observations, analysis, alerts, and predictions need to be easily discoverable and accessible from emergency response information systems and mobile devices alike to provide a dynamic and shared view of changing conditions. Many current sensor platforms need too much pre-planning and infrastructure set-up to work in rapidly evolving situations. Their non-standards-based integration systems may present barriers to information sharing. What is needed is a way of making sensors easily and immediately identifiable, accessible, usable and useful across all teams (on-scene and Operation Centers) and information management platforms joining an incident response.

An important aspect of OGC initiatives such as the IMIS IoT initiative is that vendors, developers, administrators, and subject domain experts are brought together to learn from each other and collaboratively solve interoperability problems, which arise in the course of developing geospatial data architectures and information exchange using OGC and other standards. Equally important in this collaborative framework is the identification of potential factors, barriers or considerations that while not directly under investigation, may/will have impact upon the technology applied, data used and decisions made by both the first responder community and the industry technology provides.

1.3 The RFQ Documents and Pilot Process

The IMIS IoT Initiative Management team, consisting of Sponsors and OGC personnel, has developed this RFQ to describe the requirements and architecture; and deliverables, schedule, and concept of operations, including communications plans organized in the following structure:

- RFQ Main Body (this document)
    - Initiative Objectives

  - Deliverables
  - Master Schedule
  - Terms and Conditions for Responding
- Development Approach (Annex A)
  - OGC IP Policy and Procedures
  - Work Breakdown Structure (WBS)
  - Concept of Operations
  - Communications Plan and Reporting
- Technical Architecture (Annex B)
  - Description of the architecture using Reference Model for Open Distributed Processing (RM-ODP).

All organizations interested in participating in the project effort shall respond with a proposal. Instructions for submitting proposals are provided in Section 6.

The limited cost-share funding available is intended to partially offset costs incurred by participants in support of this effort. **No funds shall be used to procure any proprietary hardware or software associated with this effort.**

Each organization with a role in the initiative shall sign a Participation Agreement that includes a Statement of Work (SOW) with OGC that outlines roles and responsibilities of each participant in the Initiative. By doing so, participants will agree to work together for the realization of the initiative goals and for the benefit of the industry. Participants SOW and related roles and responsibilities will be made available to interested parties.

1.4 Benefits to Participants

The Initiative offers a prime opportunity for Department of Homeland Security (DHS), First Responder stakeholders (e.g. Fire, Law Enforcement, Emergency Medical, and Emergency Management), vendors, users, and other interested parties to contribute to the development of interoperability solutions that makes use of lightweight, low-cost, wireless sensors in support of incident response and management. Results from this initiative will be documented in Engineering Reports (ERs) in the context of a hands-on engineering experience. This initiative is aimed to develop, test and demonstrate the use of these technologies in a real world-type scenario developed in collaboration with DHS and First Responder stakeholders.

1.5 Intellectual Property in the Pilot

This IMIS IoT Pilot project will be conducted in accordance with the OGC Intellectual Property Rights Policy and Procedures that can be found here: http://www.opengeospatial.org/about/ipr

This IMIS IoT Pilot project will be conducted to support the Department of Homeland Security (DHS) Science and Technology (S&T) Directorate's First Responder Group (FRG) to investigate, develop and test candidate architectures, components and relevant standards using lightweight sensors; and for purpose of development of new or enhanced open standards or profiles for interface with these sensors. Participants in this project will be required to allow OGC to publish documents based in whole or in part upon any intellectual property contributed by Participant ("Participant IP") in connection with this project. OGC shall be the owner of the copyright of any documentation developed as a part of this project. The Participant will be required to grant OGC a perpetual, non-exclusive, royalty-free license, with right to sublicense, to the patent rights in any Participant IP to the extent incorporated in, and necessary for the use of, a Specification that may be developed in this initiative. Beyond these requirements, The Participant retains ownership

in all Participant IP, including all patent, trade secret, copyright and other intellectual property rights in the Participant IP. Unless otherwise stated in participant's statement of work, a participant is not required to deliver software to OGC that may be developed or modified during this project.

If, during the course of this Project, any modifications to an existing OGC standard that may be found necessary, then a Change Request (CR) must be developed that documents the change. This CR does not need to be adopted by OGC during the initiative; rather it is intended to serve as documentation of both the change and the requirement that led to the change request. The CR must be submitted to OGC Change Request Log (http://www.opengeospatial.org/standards/cr/). The TC Chair will assign the CR to the appropriate Standards Working Group.

1.6 OGC Membership

Proposing organizations must be an OGC member and familiar with the OGC mission, organization, and process. Proposals from non-members will be considered, if a completed application for OGC membership or a letter of intent to become a member is submitted prior to or along with the proposal.

2 Context

2.1 Open Geospatial Consortium

The primary purpose of OGC's Interoperability Program is to bring Sponsors and industry participants together in rapid, hands-on, collaborative engineering efforts to advance the development and use of OGC standards for open geospatial interoperability.

A Pilot in the OGC Interoperability Program is a collaborative effort that applies technology elements from the OGC Technical Baseline and other (non-OGC) technologies to Sponsor scenarios. In practice, a Pilot is where an OGC standard – or set of OGC standards and other industry standards – can be "stress tested" based on real-world application and experience.

This Project will involve research and development as well as refining and documenting specifications or enhancements; and for implementing prototype software that exercises existing or enhanced specifications. The results of this project are directed at improving specifications, or providing profiles of existing standards rather than in creating new standards.

2.2 Sponsor Objectives

The IMIS IoT Project Sponsor has identified specific functional requirements to address the following objectives:

- Develop prototype capabilities that will include ad hoc, automatic deployment, discovery, and access to sensor information feeds, as well as derivation of actionable information in common formats for use in Computer Aided Dispatch, Emergency Operations Center, and information visualization systems, as well as mobile devices, including but not limited to heads-up displays
- Prepare initial specifications, profiles, Best Practices, and demonstration designs for connecting sensors and response information systems into an IoT network that is secure and based on open standards
- Prepare engineering reports to document prototype capabilities and results demonstrated in a realistic incident management scenario such as ad hoc deployment of sensors to track

/ predict migration of dangerous environmental conditions and monitor responder conditions, including but not limited to health, location, proximity to conditions, blue forces, and changes to those conditions

- Plan and conduct a final demonstration of implemented IoT capabilities using the the pilot scenario
- Develop a Springboard Test Environment that can be used to test conformance of vendor solutions with proposed specifications.
- Develop as part of the Engineering Report, potential factors, barriers or considerations that while not directly under investigation, may/will have impact upon the technology applied, data used and decisions made by both the first responder community and the industry technology providers

2.3 IMIS IoT Context

Incident responders have a hard time tracking rapidly expanding situations when their teams are already busy dealing with what has already occurred and as additional responders across domain arrive on scene. Responders must often rely on anecdotal reports or static, dated, time sensitive data to map out present conditions and may lack the data to stay on top of widespread or fast moving incidents. Rapid deployment of lightweight, inexpensive sensors offers new opportunities to gather up-to-date information about event progression, particularly where first-hand observations are dangerous or unavailable, teams are stretched thin, and scarce resources need to be allocated as effectively as possible. However; this also introduces the potential for data saturation preventing concise, actionable information and resulting decision to ensure the responders are connected, protected and fully aware. These opportunities can only be realized if responders and incident managers get useful and timely information from such sensors commensurate with ability to interpret them and the operational cost to sustain them.

2.3.1 Scenario/Use Case Context

Incident responders move within a field of operation. The goal is to characterize the environment of the field as efficiently and safely as possible. For this reason, response teams make use of modern sensing and communications technology to achieve two domains of awareness:

- The situation in the field of operation and vicinity
- The status of each response team member and response resource.

Sensors used for incident response may be deployed for use or carried by response team members. Deployed sensors can either be fixed or mobile, e.g. carried by autonomous vehicles, drones or the responder themselves. Fixed sensors remain at a deployment location, but might have the capability to quickly be relocated and re-integrated if necessary. Sensor platforms include communications functionality and may provide relay and data collection functionality as well. Wearable sensors may provide environmental information but may also monitor the health of each team member as well as providing consolidated, integrated situational awareness of the incident and responders.

Sensor observations enhance the situational awareness of responders in cases where the scope of an incident is increasing and/or migrating. This poses the challenge of detecting those changes and then effectively re-deploying or moving existing responders and augmenting when additional responders across first responder domains (e.g. Fire, Law Enforcement, Emergency Management

and Emergency Medical) arrive on scene. Deployed sensors are rarely of the same type and generation and likely differ in underlying technology. Even individual response teams may be deploying heterogeneous sensor collections as new technologies are added from year to year. All such sensors need to be discoverable by any participating responder at deployment. In addition, all sensors must transmit data successfully through available relay stations and communication devices into operating response information networks. They utilize standards-based IoT protocols for rapid, nearly automatic integration into response information systems. For example, an IMIS profile of Sensor Web Enablement (SWE) SensorML, used to describe sensor characteristics, may provide the metadata necessary to facilitate this plug-and-play operation.

The resulting sensor cloud creates huge amounts of observation data that can be impractical and distracting for responders. Sensor Web Enablement based components such as collection and processing services are utilized to analyze and model the data in real time, reducing the overload to only essential and actionable information; that is information that answers specific questions important to incident responders with well understood reliability and uncertainty characteristics. Data mining algorithms used to develop such models often depend on particular characteristics of the incoming data. If sensors used for training the algorithm differ from those used at deployment, results may be unreliable. Sensor discovery protocols and descriptions are the means to ensure consistency between incoming data and actionable alerts and predictions. Protocol mappings between SWE standards and IoT communications protocols ensure communication of all necessary information between sensors and decision support tools. IMIS-specific profiles of the Observations and Measurements (O&M) standard provide for successful exchange of raw and derived observations between responder information systems.

Additional details for this scenario is provided in Annex B that describe the scenario and use cases that will be used in the design, testing and demonstration to be performed as set forth in the Concept of Operations, contained in Section 4 of Annex A to this RFQ/CFP. Deliverable requirements are provided in Section 0 of this RFQ Main Body and in Annex B (Technical Architecture).

2.3.2 Technical Context

Participants in this initiative will bring available or proposed application software, develop schema and related schema instance documents and data as needed to support design, testing and validation of the scenario and use cases described in Annex B. Based on the architecture described in Annex B, participants will have flexibility to design components and deployment architecture for use in testing and demonstrations associated with the operational context. The Development Approach to be used in this initiative is described in Annex A.

3 Your Role in the Project

There are several possible roles that organizations/participants may play in the initiative. These are:

- Provide one or more components needed to generate, process, test or validate interoperability in the architecture in one or more use case scenarios described in Annexes A and B
- Provide contributions as a Subject Matter Expert (SME) in the Stakeholder community required for analysis, modelling, development or testing to address requirements in the initiative

- Participate in demonstrations and tests using provided application software components, schema and related schema instance documents, and/or
- Provide content, personnel, software, hardware, data, or facilities that will contribute to the overall success of the initiative.

Participants should propose specifically against funded Work Items defined by the sponsors (see Annex A), but may go beyond that to request and propose in-kind contributions that address unfunded requirements. For example, Participants may propose in-kind contributions that are supportive and compatible with the initiative objectives but is not specifically listed as a work item in the architecture. Participants should note that sponsors plan only to fund Work Items labelled as funded in this current RFQ.

4 Master Schedule

The following table details key events and activities associated with this RFQ (more details can be found in Annex A):

Table 1, IMIS IoT Project Master Schedule

Schedule Event / Milestone	Date
RFQ/CFP Issued	22 April 2015
Prospective Bidder's Q&A Webinar	4 May 2015
Deadline to submit questions on RFQ/CFP to OGC	11 May 2015
Proposals due to OGC	**22 May 2015 by 1700 EDT (2100 UTC)**
Project Kickoff Workshop	9-10 July 2015
Project Plan refined following Kickoff Workshop	17 July 2015
Draft reports complete	6 November 2015
Capability development and Interim Demonstrations complete	22 December 2015
Conduct final demonstration	11 January 2016 (e)
Springboard Test Environment setup complete	15 January 2016
Final reports complete	29 January 2016
Project end date	1 February 2016

(e) – Estimated date subject to modification

5 Deliverables

Deliverables for the IMIS IoT Initiative are shown in the following table. Three types of deliverables are requested:

1. Documentation such as Engineering Reports (ERs) and Change Requests (CRs)

2. Schema and schema instance documents
3. Demonstration and related presentation media materials

The deliverables for this project are identified in the following tables. Details of the technical requirements are contained in Annex B, Technical Architecture.

Table 2, IMIS IoT Documentation Deliverables

Del #	Name / Type
D1	IMIS IoT Engineering Report (ER)
D2	Recommendations for Protocol Mapping IoT devices to SWE Engineering Report (ER)
D3	IMIS Profile Recommendations for OGC Web Services Engineering Report (ER)
D4	Demonstration Script and Final demonstration materials (slide presentation and related video materials)

Table 3, IMIS IoT Component Deliverables

Del #	Name / Type
C1	Mobile Application
C2	Desktop Client
C3	Web Map Service (WMS) serving basemap and IoT Feature Layers
C4	Web Feature Service (WFS)
C5	Sensor Observation Service (SOS) for In Situ Sensors and Mobile
C6	Sensor Observation Service (SOS) for Wearable Sensors
C7	Catalog (HubCat registry)
C8	Web Processing Service (WPS) for sensor data analysis and model data processing
C9	Sensor Planning Service (SPS) for tasking remote sensors
C10	Web Notification Service (WNS)
C11	Sensor Alert Service
C12	IoT Hub for Protocol Mapping/Adapter (S-Hub)
C13	IoT Hub for Protocol Mapping/Adapter (S-Hub)
C14	IoT Hub for Protocol Mapping/Adapter (S-Hub)
C15	Service Interface for IoT Device 1 (identify specific device type)
C16	Service Interface for IoT Device 2 (identify specific device type)
C17	Service Interface for IoT Device 3 (identify specific device type)
C18	Service Interface for IoT Device 4 (identify specific device type)
C19	Service Interface for IoT Device 5 (identify specific device type)
C20	Service Interface for IoT Device 6 (identify specific device type)

Del #	Name / Type
C21	Service Interface for IoT Device 7 (mobile image sensor)

6 Proposal Submission Information

6.1 General Terms and Conditions

Documentation submitted in response to this RFQ will be distributed to members of OGC staff, the IP Team, and Sponsor representatives. Submissions will remain in the control of this group and will not be used for other purposes without prior written consent of the proposing organization. Please note that you will be asked to release the content of your proposal (less financial details) once you agree to participate in the Pilot effort. Proprietary and confidential information must not be submitted in response to this request.

Participants will be selected to receive cost sharing funds on the basis of adherence to the requirements stipulated in this RFQ and the overall quality of their proposal. Those proposing organizations not selected for cost sharing funds are encouraged to participate in the IMIS IoT Initiative on an in-kind basis.

Each participant, funded or unfunded will be required to enter into a contract with OGC. This Participation Agreement will include a Statement of Work defining a participant's responsibilities. The Participation Agreement also establishes that a participant agrees to work together towards the common goals of the initiative. Further details on this issue are found in the Concept of Operations (Annex A).

6.2 Response Instructions

To be considered, all responses to this RFQ shall be "complete"; that is, your submission must provide all information requested in section 7. Responses shall use the response template provided in the RFQ package.

Your response shall consist of a technical volume and a separate volume to indicate your cost-share request and in-kind contribution. An outline with page limits is provided in section 7.1. Reviewers will be instructed to not read or evaluate any materials in excess of the page limits.

6.3 How to Submit

Submit an electronic copy of your proposal to the OGC Technology Desk (techdesk@opengeospatial.org) at OGC. Microsoft Word® 6.0 or higher format is preferred; however, Portable Document Format or Rich Text Format is acceptable.

Proposals must be received at the OGC Technology Desk no later than **the date and time shown in** Table 1, IMIS IoT Project Master Schedule

6.4 Questions and Clarifications

Questions and requests for clarification should be sent electronically to the OGC Technology Desk (imis-iot-responses@opengeospatial.org). All clarifications will be posted to the public IMIS IoT announcement web site located here: (http://www.opengeospatial.org/projects/initiatives/133).

Deadline to submit questions for this solicitation is shown in Table 1, IMIS IoT Project Master Schedule

6.5 Reimbursements

The OGC will not reimburse submitters for any costs incurred in connection with preparing proposals in response to this RFQ.

7 RFQ Format and Content

7.1 Proposal Outline

Included with this RFQ archive you will find several templates: the response template, the cost sharing request spreadsheet template, and the in-kind contribution spreadsheet template. Proposing organizations shall use these templates in preparing their proposals. The proposal should follow the outline:

Technical Proposal

- ❒ Cover page (does not count in the page count)
- ❒ Overview (Not to exceed two pages; will not contribute to technical evaluation)
- ❒ Proposed contribution (Basis for Technical Evaluation) (not to exceed 7 pages)
  - Understanding of interoperability issues, understanding of technical requirements, and potential enhancements to OGC and related industry architectures and standards
  - Recommendations to enhance Information Interoperability through industry-proven best practices.
- ❒ Proposed contribution cross referenced to WBS (Contributes to Management Evaluation)

Cost-Share and In-Kind Proposal (Not to exceed seven pages)

- ❒ Cost sharing request (include details using the Excel template for reporting cost-share request)
- ❒ In-Kind contributions (include details using the Excel template for reporting in-kind contributions)

Each of these Sections is described below.

7.2 Cover Page

Provide the name(s) of the proposal submitter(s) and point of contact information. Teams should list all teammates and point of contact information for each. When submitting point of contact information, please provide both a business/financial and technical point of contact.

7.3 Overview

Provide an introduction to the contents of your proposal and its benefits.

7.4 Technical Proposal

7.4.1 Proposed Contribution

Describe your proposed contribution to the initiative based on your desired role consistent with the Annex B Technical Architecture. Please organize your description using the categories described in paragraphs 7.4.1.1 through 7.4.1.5 below. The emphasis of this initiative is on interoperable solutions to the IMIS IoT functional requirements. Your RFQ response should be developed from that perspective. Justify your approach.

7.4.1.1 Specification Development

If you are proposing to contribute to the refinement or support the refinement of interoperability specifications or Best Practices for interfaces, operations, encodings, messages, or other relevant technologies, please the following in your proposal:

1) Your views on the Architecture and the modifications/additions you would recommend be undertaken during the course of the initiative.

2) Suggestion modifications/additions you would recommend for affected OGC baseline standards or other industry standards or protocols.

3) A list of personnel and brief summary of their qualifications to carry out proposed tasks.

4) Roles and responsibilities that your technical representatives may perform (e.g., Engineering Report (ER) author, schema editor, model designer, or technical contributor. Technical contributors shall write or design subsets of the specification. Everyone is expected to review work in progress.

7.4.1.2 Software Implementations

If you are proposing to contribute by providing or using software implementations, schemas, tools, testing, or demonstration of requirements specified in the Technical Architecture (Annex B), please include as much detail as possible in your proposal concerning the purpose of the software implementations or tools to be provided or used that relate to your proposed effort.

7.4.1.3 Demonstration or Test Development

All components being implemented in this initiative have some roll to play in the overall demonstration. If you are proposing to develop specific demonstrations or tests, please provide as much detail as possible concerning your proposed effort. Delineate aspects of the initiative scenarios to which you believe you contributions would contribute. In particular explain how your work will demonstrate interoperability as well as provide reliable measures of service performance and appropriate use to meet initiative objectives.

7.4.1.4 Personnel

Each bidder proposing to contribute personnel to the initiative should indicate the capabilities and experience of the personnel, location and mobility information (in other words, will the personnel need to remain at their present location? Will you support travel?). Indicate which personnel would attend the Kickoff Workshop and other project activities.

7.4.1.5 Sponsor and Government-Provided Information

Initiative sponsors or other government representatives will provide selected information or data, such as scenarios, use cases, data or specifications for information sharing types or formats to support the scenarios and demonstrations for this pilot as described in Annex B (Information Viewpoint). Participants may also propose to contribute these or other forms of content that you believe would be required or useful to achieve or enhance results of the initiative.

7.4.2 Proposed Contribution Cross Referenced To WBS

Review the WBS found in Annex A and map your proposed contribution to the applicable task categories and items. Indicate which requirements are being met with your contributions in the descriptions of activities that your organization proposes to undertake. WBS elements in Annex A that are shaded gray do not require a bidder's response.

7.5 Level of Effort and Cost-Share Proposal

Please provide an estimate of the value of your proposed contributions, including engineering, management, communications, travel, and so forth.

Your proposed Level of Effort and Cost-Share request shall be provided as a separate document from the Technical Proposal.

7.5.1 Cost-Sharing Proposal Request

This section is *required* only from proposing organizations requesting cost sharing funds. Please provide a requested amount of cost-sharing funds (in US Dollars) and provide details of the costs that are being offset (e.g., labor category, number of hours, and hourly rate). Note that cost-sharing funds will only be provided for only those activities uniquely attributable to initiative participation; e.g., a recipient should not request funds to offset costs that would have otherwise been incurred and funded through some other source such as internal research and development funding. This section must include a certification that the proposed reimbursable costs would not be otherwise incurred in support of non-Pilot activities. Use the associated cost-sharing template (excel spreadsheet) to itemize the costs being offset. This should be included in the section beginning with Level of Effort Estimate.

7.5.2 In-Kind Contributions

Provide an estimate of the value of in-kind contributions that your organization will make to the initiative. **This should reflect such contributions as labor, equipment, software, or data.** Use the associated in-kind contribution template spreadsheet to itemize the contributions being provided. Sponsors and OGC will use this information in the development of future initiatives. This information should be included in the section beginning with Level of Effort Estimate.

It is expected that the value of in-kind contributions will be approximately equal to or greater in value as compared to the cost-sharing requests of each proposer.

8 Evaluation Criteria

Proposal responses will be evaluated according to criteria set by the Sponsor and associated partners. Those criteria can be divided into three areas: Technical, Management, and Cost.

8.1 Technical

The Technical criteria are described below.

- All applicable Requirements in the RFQ are addressed in the proposal
- Response takes a risk-adjusted technical approach that supports accomplishing requirements
- Creativity and originality in the proposed solutions
- Proposed solutions could be achieved with available resources and involves no more than acceptable risk for a pilot type of initiative
- Proposed solutions are relevant to initiative goals
- Proposed personnel have the necessary skills and experience to support the proposed contribution

8.2 Management

- Proposal adheres to and addresses Work Breakdown Structure
- Willingness to work in collaborative environment
- Achieves Sponsor goal of enhancing availability of SCOTS or standards-based open source products in the market place

8.3 Cost

- Cost-share request is reasonable for proposed effort
- In-kind contribution is of value to IMIS IoT initiative